law that the maximum of polarization takes place in reflection from the joint surface of two media. The angle of incidence is complement to the angle of refraction, or the tangent of incidence (as the author expresses it,) is equal to the quotient of the indices of refraction of the media.

After describing in a series of propositions the various degrees in which light becomes polarized by reflection or refraction at different angles, and the number of reflections or refractions necessary to effect complete polarization at various angles remote from that which produces the maximum, the author investigates the origin of a certain quantity of unpolarized light which exists even at the maximum polarizing angle in reflection from substances of high refractive power; and he shows it to depend on the different refrangibility of differently coloured light. For when the incidence is such that the mean refrangible rays are completely polarized, it is evident that the incidence will not be such as to polarize completely either the red or the violet rays, and consequently a beam composed of these will appear as white light not polarized; and when the polarization is effected at the surface of substances of high refractive and dispersive power, this portion will form a large proportion of the whole reflected light. On the contrary, any pencil of homogeneous coloured light, though only once reflected, may be completely polarized, even at the surfaces of the densest substances, if incident at an angle correctly adapted to its refrangibility.

The author purposes, on some future occasion, to point out the laws which regulate the polarization of light under various other circumstances not noticed in the present communication.

On some Phenomena of Colours, exhibited by thin Plates. By John Knox, *Esq. Communicated by the Right Hon. Sir* Joseph Banks, *Bart. G.C.B. P.R.S.* Read April 6, 1815. [*Phil. Trans.* 1815, *p.* 161.]

It is not surprising, says the author, that neither Sir Isaac Newton, nor Dr. Herschel, nor any other writer who has followed on the same subject, have given any explanation which appears to him to be satisfactory, since they have not been in possession of the phenomena connected with this inquiry. After stating various objections which he considers as conclusive against the alternate disposition to be reflected or transmitted inherent in the rays of light, and recurring at certain equal intervals which are expressed under the name of fits by Sir Isaac Newton, Mr. Knox proceeds to describe those new phenomena which form the principal subject of his paper, and which he has been enabled to make by the assistance of the method of observing such appearances employed by Dr. Herschel. This method consists in using the shadows of some opake substance held over thin plates of glass, for the purpose of distinguishing from each other the several effects produced by different surfaces employed at the same time. If a plate of unsilvered glass be laid upon a table before

a window, and a piece of wire be held over it, there will be seen two shadows of the wire, one from each of the surfaces; if a second plate be laid upon the former, there will be three shadows, one from the uppermost surface, one from the lowest, and a third between them from the contiguous surfaces which together form but one image. If either of the surfaces in contact be slightly curved, so as to be a portion of a large sphere, then rings of colours observed by Newton are seen, and are found to arise from reflection at the surfaces of contact, as is proved by their being intercepted by the middle shadow of the wire. At the same time may also be seen other rings, occasioned by light transmitted through the surfaces in contact and reflected back to the eye from the undermost surface; but as these rings are not the subject of Mr. Knox's experiments, he painted the under surface of the lower plate black, in order to prevent their interference with his observations. Under these circumstances, a second image of the rings, formed by reflected light, is seen by means of two reflections from the parallel surfaces of the upper plate of glass; and in a favourable light further repetitions of the same rings may be seen by several successive reflections. Under these circumstances, in addition to these appearances, Mr. Knox observed certain fringes to proceed on each side from the points of intersection of a set of primary circles, with their reflected images appearing as parallel lines at right angles to the line joining their centres, and divided into two sets, coloured in opposite directions from a central line. When a piece of glass is laid upon a convex surface, the secondary set is equal to the primary, and in that case the fringes are straight lines; but when by due combination of surfaces the primary and secondary sets differ in size from each other, then these fringes assume a circular form, coloured according to the same law as the straight fringes, being divided into two classes by a middle curve, towards which the violet edges of the curves on each side are turned. To these curves, which have not been observed before, Mr. Knox gives the name of intersectionary rings.

In the same manner as one set of rings is produced by the intersection of primary and secondary reflected circles with each other, they may also be produced by the intersection of other sets, either of transmitted or reflected rings, and may be rendered numerous by a number of surfaces of various forms; or, on the contrary, may be exhibited in their most simple state by the intersection of primary fringes with each other. For if two slips of plane glass be applied to each other at a small angle, the fringes of colour then appear as straight bars of prismatic colours parallel to each other. And if a third plate of glass be placed upon the uppermost, with a slight inclination situated transversely to the former, the bands thus produced are at right angles to the preceding; and by their intersections present a set of intersectionary fringes parallel to each other, and bisecting the angle between the primaries from which they originate. These fringes, as in the former cases, are divided by a central band into two sets, of which the colours are oppositely placed, and on this

account the author calls them *binary*, a term which applies to the numerous class of phenomena which he has observed by a great variety of combinations. He reckons as many as six kinds of rectilinear bands produced in his experiments which have not been noticed by any other writer.

In order to ascertain what effect the presence of air might have on these phenomena, the author repeated some of his experiments in vacuo, and found that the removal of the air had no perceptible effect.

Even the interposition of water between the surfaces appears to him to diminish but little the brilliancy of the colours. Nitric acid has more effect; and in fluids of greater density, as olive oil, the whole class of phenomena disappear.

It appears somewhat strange, says Mr. Knox, that Newton should have attributed the coloured rings to a plate of air and to supposititious fits of easy reflection and refraction, when a cause more obvious was at hand; namely, the interference of the reflecting and refracting strata diffused over the contiguous surfaces: for it may be supposed, that when a ray passing out of glass into air is interrupted and receives a new impulse by the influence of a second refracting medium, these contrary impulses may be repeated many times, and by repeated vibration may affect the rays according to their different refrangibility, so as to separate them into differently coloured spectra. He therefore thinks it highly probable, that by this compound action and reaction between the strata and light, and between the rays of light themselves, all the various phenomena are produced, although from their extreme minuteness an accurate knowledge of the mode of operation is not to be expected.

Some farther Observations on the Current that often prevails to the Westward of the Scilly Islands. By James Rennell, *Esq. F.R.S.* Read April 13, 1815. [*Phil. Trans.* 1815, *p.* 182.]

In the course of twenty-one years that have elapsed since the author's original communication on this subject was published in our Transactions, he has collected many new instances of the effects of the current, tending to confirm the general observations respecting its course from Cape Finisterre to Scilly, and affording clearer proof of the strength of the stream than any evidence that he could adduce on the former occasion. The first fact relates to its commencement in an easterly direction, toward Cape Finisterre, from a distance of at least fifty-three leagues, in the instance of the Earl Cornwallis Indiaman, which drifted in that direction at the rate of twenty-six miles per day.

In the second instance, a bottle thrown out by a Danish navigator was carried in a direction E. by S. to Cape Ortegal, a distance of sixty-four leagues.

A third fact was communicated to the author by Admiral Knight,